Kennedy NASA Procedural Requirements

Effective Date: **May 9, 2019**

Expiration Date: **May 9, 2024**

Responsible Office: **Spaceport Integration and Services**

KSC HEARING LOSS PREVENTION PROGRAM

National Aeronautics and Space Administration

John F. Kennedy Space Center

KDP-KSC-T-2120 Rev. Basic

Change Log

Date	Revision	Description
9/24/12	B-1	Replace reference to cancelled NPD 1820.1, NASA Environmental Health Program with NPD 1800.2C, NASA Occupational Health Program on page 4, P.3.c.
11/19/13	C	Global – Changed 'Health and Safety' to read "Safety and Health' 1.1.c., f. Clarify role of OHF in making recommendations for medical referrals to employers and employees. 1.5. Corrected title for the Medical and Environmental Support Contract (MESC) 1.5.l. Corrected reference to Respiratory Protection Program 1.6.a. Added 'as appropriate' to allow employer discretion to limit referrals to cases with work-related causality 1.6.c. Clarified role of Safety and Health organizations in requesting reassessment of noise hazards 1.8. Changed 'hearing Conservation Officer' to 'employer's Safety and Health Program'. 1.8.c. Added 'as appropriate' to allow employer discretion to limit referrals to cases with work-related causality 1.8.l. Clarified supervisors role in scheduling exit audiograms 2.2.b. Clarified Table reference 2.2.c. Clarified criteria for Hearing Conservation Program enrollment 2.3.a. Included reference and link for use of the NASA Buy Quiet and Quiet by Design Web site 2.3.b. Clarified Table reference 2.4. (1) – (3) Added reference and link for use of the NASA Buy Quiet and Quiet by Design Web site, added requirements for use of NASA Form 1707 for Civil Service procurement of hazardous-noise equipment and KSC Form 28-1103 for contractor procurement of hazardous-noise equipment 2.4.c. and c.(2) Clarified Table reference 2.5.b. Clarified requirement for labeling tools and equipment 2.5.c. Deleted reference to specification for warning signs 2.6.c. Clarified threshold for required use of hearing protection devices 2.6.d. Clarified requirement for hearing protection devices for employees with Hearing Threshold Shifts 2.6.f. Clarified requirement for de-rating of ear muffs and ear plugs 2.7.(2) Clarified threshold for identifying a high noise area 2.7.b., c. Clarified threshold for area noise monitoring and noise dosimetry monitoring 2.7.f. Clarified start date for employee notification of noise monitoring results 2.8.a. Clarified criteria for employee Hearing Conservation Program Enrollment 2.8.g. Deleted 2.8.h. Clarified requirement for transition of employee audiometric test records between employers during contract transitions. 2.9.j. Deleted audiogram age correction for personnel >60years. 2.9.l. Clarified criteria for audiogram retest

		2.9.n. Deleted reference to KSC Hearing Conservation Officer. Revised employer notification letter content to delete OSHA reference. 2.11.b. Provided direction for reporting hearing loss to NASA IRIS mishap reporting system Definition A.15 Deleted reference to Table 2 Table B Revised note to correct error (deleted 'fast response')
5/18/15	C-1	Administrative changes made to reflect change in directorate name from Center Operations to Spaceport Integration and Services
11/6/18	C-2	The extensive rewrite of this KNPR necessitated a pre-review of the draft KNPR, thus extending the revision and rewriting process longer than a typical update.
2/15/19	C-3	Due to the Government shutdown and furlough, additional extension approved to allow for Center wide review, comment disposition, and processing of final signatures.
5/9/19	D	Table of Contents (TOC) administrative update for hyperlinks P.4. Updated hyperlinks and reference documents 1.1. Clarified requirements for Standard Threshold Shift (STS) follow up investigations, health care professional qualifications, and audiometric testing rooms. 1.2. Removed Human Resources Office and KSC Institutional Support Services Contractor responsibilities sections. Simplified responsibilities of KSC Industrial Hygiene Officer. 1.3. Clarified KSC medical and environmental support contractor role in coordinating response to STSs with contractor safety and health organizations. Added wording to clarify report distribution requirements. Added a requirement for the KSC medical and environmental support contractor to chair the Noise and Hearing Loss Prevention Working Group. 1.4. Added wording to clarify and simplify contractor safety and health responsibilities. Replaced the "Incident Reporting Information System" with the NASA Mishap Information System. 1.7. Clarified section requirements. 1.8. Removed Buy Quiet and Quiet by Design requirements from supervisor responsibilities. 1.9. Clarified wording to provide a consistent term for a noise controlled area. 1.10 Added Operations Organizations responsibilities section. 2.1. Added section recognizing additional undesirable effects of noise. 2.2. Clarified requirements and added action level language. 2.3. Distributed requirements from item "a" into separate line items for better clarity. 2.4. Clarified requirements when hearing protection is inadequate for noise level. 2.5. Updated hearing protection device derating requirements to comply with NPR 1800.1 and clarified requirements. 2.6. Editorial and grammatical changes. 2.7. Editorial and grammatical changes.

		2.8. Updated revisions of referenced standards, clarified audiometric test equipment calibration requirements, and updated audiogram re-test requirements. 2.10. New section: Work-relatedness Determination and Reporting. 2.11. Clarified requirements for work area follow-ups after an STS is detected and possible work reassignments for employees with an STS. 2.12. Editorial and grammatical changes. 2.13. Changed section title to “Access to Records”. Added process for employer to obtain employee records protected by the Privacy Act. 2.14. Changed section title to “Maintenance of Records” and clarified requirements. Appendix A: Made Appendix A Definitions Appendix B: Made Appendix B Acronyms Appendix C: Added tables to TOCs Administrative changes to hyperlinks and overall formatting of document.

TABLE OF CONTENTS

PREFACE

P.1 Purpose

a. This Kennedy National Aeronautics and Space Administration (NASA) Procedural Requirements (KNPR) contains the requirements for the development, management, and implementation of the Kennedy Space Center (KSC) Hearing Loss Prevention Program. The primary objective of the program is to implement Center policy and provide the requirements for the evaluation and control of workplace noise hazards and prevention of employee hearing loss.

b. KSC policy provides employees with an environment in which occupational health hazards are identified, evaluated, eliminated or controlled in such a manner that personnel do not suffer adverse health effects as a result of their employment. Activities shall be conducted in a manner that conforms to all applicable Federal, state and local regulatory requirements.

c. The requirements presented in this KNPR implement Federal Occupational Safety and Health Administration (OSHA) regulations and NASA management policy for Industrial Hygiene Programs. NASA, contractor management, and their organizations/programs/projects shall supplement the provisions of these requirements by implementation of internal policies and instructions, as needed.

d. Additional requirements for the KSC Industrial Hygiene Program are contained within KNPR 1840.1 KSC Hazard Communication Program; KNPR 1820.4, KSC Respiratory Protection Program; and KNPR 1840.19, KSC Industrial Hygiene Programs.

P.2 Applicability

a. This directive applies to all NASA organizational elements located at KSC and NASA-KSC facilities and operations at other locations. This includes NASA-KSC contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements.

b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term “shall.” The terms “may” or “can” denote discretionary privilege or permission, “should” denotes a good practice and is recommended, but not required, “will” denotes expected outcome, and “are/is” denotes descriptive material.

c. In this directive, all document citations are assumed to be the latest version unless otherwise noted.

P.3 Authority

a. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees

b. Title 29, Code of Federal Regulations (CFR), Part 1960, Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters

c. NASA Policy Directive 1800.2, NASA Occupational Health Program

d. NPR 1800.1, NASA Occupational Health Program Procedures

P.4 Applicable Documents and Forms

a. Privacy Act of 1974 as amended (5 U.S. Code Sec.552a Records Maintained on Individuals)

b. 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses

c. 29 CFR 1910.1020, Access to Employee Exposure and Medical Records

d. 29 CFR 1910.95, Occupational Noise Exposure

e. 29 CFR 1926.52, Occupational Noise Exposure

f. NPR 1441.1, NASA Records Management Program Requirements

g. KNPR 1820.4, KSC Respiratory Protection Program

h. KNPR 1840.1, KSC Hazard Communication Program

i. KNPR 1840.19, KSC Industrial Hygiene Programs

j. NASA Form 1707, Special Approvals and Affirmations of Requisitions

k. KSC Form 6-2, Initial Record of Injury/Illness

l. KSC Form 28-1103, Pre-Purchase / Pre-use Analysis Checklist

m. National Institute for Occupational Safety and Health (NIOSH), Occupational Noise Exposure – Revised Criteria 1998

n. ANSI S1.4-2014, Electroacoustics – Sound Level Meters

o. ANSI S3.1-1999, Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms

p. ANSI S3.6-2010, Specifications for Audiometers

q. ANSI S1.13-2005, Measurement of Sound Pressure Levels in Air

r. ANSI S1.25-1991, Specification for Personal Noise Dosimeters

s. ANSI S12.19–1996, Measurement of Occupational Noise Exposure

t. American Conference of Governmental Industrial Hygienists, TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

u. AFOSHSTD48-20, Occupational Noise and Hearing Conservation Program

P.5 Measurement/Verification

Triennial audit of the KSC Occupational Health Program by the NASA Headquarters Office of the Chief Health and Medical Officer and interim KSC self-audits.

P.6 Cancellation

This revision cancels KNPR 1820.3, Rev. C-3, KSC Hearing Loss Prevention Program.

/original signed by/

Nancy P. Bray
Director, Spaceport Integration and Services

Distribution: TechDoc Library

CHAPTER 1. Responsibilities

1.1 Occupational Medicine Officer

1.1.1 The KSC Occupational Medicine Officer, or designated representative, is responsible for:

a. Providing medical evaluations, obtaining occupational history of participants in the Hearing Conservation Program (HCP), and evaluating test results.

b. Maintaining a record of personnel receiving HCP physical examinations and providing audiometric examinations for those persons.

c. Notifying employees of significant hearing loss or other medical pathology of the ear, and explaining needs and recommendations to the employer regarding further testing or referrals, in accordance with this KNPR.

d. Notifying the employee and their employer, within 21 days, if testing establishes a Standard Threshold Shift (STS) or deafness has occurred, and initiating an industrial hygiene followup investigation of the employee's work-place.

e. Recommending the reassignment of employees to work in low-noise areas in coordination with the employee's employer, when necessary, to prevent further significant hearing loss or the aggravation of other medical conditions that could be worsened by work in a high-noise area. For civil service employees, the Aerospace Medicine and Occupational Health Branch will coordinate with the employee's supervisor, Human Resources, and the Center Disability Program Manager to make every reasonable effort to reassign the employee.

f. Recommending employee referral to an audiologist or qualified physician. Refer to section 2.9 KSC Medical and Environmental Support Contractor Medical Referrals for additional information.

g. Ensuring physicians or other qualified licensed healthcare professionals who conduct or supervise the audiometric testing of employees have reviewed the requirements of this standard and 29 CFR 1910.95.

h. Ensuring audiometric tests are performed by a Council for Accreditation in Occupational Hearing Conservation (CAOHC) certified audiologist, otolaryngologist, or other physician, or by a health professional under the supervision of a CAOHC certified physician or audiologist.

i. Ensuring audiometric test equipment is calibrated to meet the requirements of the latest revision of American National Standards Institute (ANSI) S3.6, Specification for Audiometers.

j. Ensuring ambient noise levels in the audiometric test rooms meet the specifications in the latest version of ANSI S3.1, Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms.

k. Maintaining audiometric test records and other records required in the applicable records retention schedules in NASA Procedural Requirements (NPR) 1441.1 and 29 CFR 1910.95.

l. Providing employee access to medical records in accordance with the requirements of paragraph 2.13, Access to Records.

m. Providing audiometric examinations.

1.2 KSC Industrial Hygiene Officer

The KSC Industrial Hygiene Officer (IHO), or a designated representative, is responsible for implementing and administering this KNPR.

1.3 KSC Medical and Environmental Support Contractor

1.3.1 The KSC medical and environmental support contractor Industrial Hygiene Office is responsible for:

a. Providing baseline surveys of each new operation, job, or procedure having the potential of creating a noise hazard.

b. Designating hazardous-noise areas.

c. Maintaining an inventory of high-noise areas including noise levels recorded in those areas.

d. Providing monitoring of hazardous, or potentially hazardous, noise areas or operations, including personnel noise dosimetry.

e. Providing followup investigations of employee work-places for employees with an identified STS in coordination with the employee's health and safety representative, to include conducting interviews and a worksite visit as appropriate.

f. Coordinating the distribution of noise survey reports with the employer's health and safety organization.

g. Notifying supervisors, and/or responsible safety and health organizations, of the requirements for employees to participate in the HCP when monitoring data shows the employee's noise exposure exceeds the criteria for enrollment.

h. Reviewing facility and operational plans to assess the adequacy of precautions taken to control noise exposures when requested.

i. Recommending methods to control hazardous-noise exposure.

j. Maintaining records in accordance with Section 2.14, Maintenance of Records.

k. Advising and assisting in the development of HCP training courses.

l. Recommending and evaluating the selection of hearing protection devices to assure they provide adequate attenuation.

m. Monitoring background-noise levels in audiometric booths used at KSC.

n. Providing consultation to procurement and engineering design organizations in implementing the requirements of NPR 1800.1, as it applies to NASA Web site, Buy Quiet and Quiet by Design , for elimination of hazardous-noise sources.

o. Chair the KSC Noise and Hearing Loss Prevention Working Group

1.4 Contractor Safety and Health Program

1.4.1 Contractor Safety and Health Program personnel are responsible for:

a. Developing and implementing organization noise and hearing loss prevention policies and procedures.

b. Evaluating work areas to identify potential noise hazards and coordinating noise surveys with KSC medical and environmental support contractor Environmental Health.

c. Communicating and coordinating corrective actions for the abatement of identified noise hazards.

d. Assisting in the design and implementation of engineering and administrative controls to eliminate and/or reduce occupational noise.

e. Coordinating with procurement and engineering design organizations in implementing the requirements of NPR 1800.1 as it applies to NASA Web site, Buy Quiet and Quiet by Design, for elimination of hazardous-noise sources.

f. Maintaining business records of the HCP implementation.

g. Reporting work-related hearing loss in the NASA Mishap Information System (NMIS).

h. Participating in the KSC Noise and Hearing Loss Prevention Working Group.

1.5 Heads of Organizations

1.5.1 Heads of primary organizations and heads of contractor organizations are responsible for:

a. Ensuring the development of a written HCP program to implement the requirements of 29 CFR 1910.95, where applicable.

b. Providing for the design and implementation of feasible engineering and administrative controls where required to reduce or eliminate occupational noise exposures.

c. Ensuring employees are provided HCP training in accordance with 29 CFR 1910.95 and this KNPR.

d. Ensuring that affected employees are notified of the results of Health Hazard Evaluations (HHE) in accordance with the requirements of 29 CFR 1910.95.

1.6 Supervisors

1.6.1 Supervisors are responsible for:

a. Coordinating with the NASA IHO, or contractor safety and health organization, to assess potential noise hazards in employee work areas or reassess noise hazards and exposures following any known changes in operations or procedures that may increase/decrease personnel exposure to noise.

b. Ensuring the use of required engineering controls, administrative controls, and hearing protection devices.

c. Ensuring noise-hazard warning labels, placards or decals are posted and maintained on equipment and tools that create a noise hazard.

d. Notifying affected employees of workplace noise hazards and ways to minimize exposures.

e. Notifying each affected employee of noise-exposure monitoring results.

f. Providing the training coordinator the names of employees working in areas that exceed the criteria listed in Section 2.2 when identified by the employer's safety and health organization.

g. Ensuring their employees keep their HCP examination appointments at medical facilities.

h. Ensuring an exit audiometric examination is scheduled for employees enrolled in the HCP in accordance with the organization's safety and personnel policies.

i. Ensuring employees who are participants in the HCP attend scheduled training.

j. Attending annual HCP training, if supervising participants in the HCP.

k. Referring personnel who complain of hearing loss or other hearing problems to the Occupational Health Facility (OHF).

1.7 Individual Employees

1.7.1 Individual employees are responsible for:

a. Notifying supervisors of areas, operations, or equipment that may be a noise hazard.

b. Cooperating with supervisors as well as safety and health personnel in actions to evaluate noise hazards and prevent hearing loss.

c. Following procedures established for controlling noise exposures, including wearing and maintaining hearing protective devices furnished for their protection.

d. Addressing potential noise hazards and required controls when preparing a Job Hazard Analysis.

e. Attending scheduled training courses and medical appointments.

1.8 Facility Managers

1.8.1 Facility Managers are responsible for:

a. Ensuring warning signs are posted at the perimeter/entry of noise-controlled work areas and on facility equipment in accordance with Paragraph 2.4.c, and that the warning signs clearly indicate the hazard of high noise levels and state the requirement to wear hearing protection.

b. Coordinating with operations organizations to notify facility tenants of hazardous-noise operations and implementing noise controls, when necessary.

1.9 Engineering Organizations

1.9.1 Heads of engineering organizations are responsible for:

a. Ensuring new, or modified, facilities and equipment are designed, procured, or developed to minimize noise hazards in accordance with Section 2.3.

b. Providing operation and maintenance procedures for engineered systems to maintain effective noise control.

c. Coordinating the design and implementation of engineering noise-control measures with the KSC IHO, KSC IHO designated representative, or contractor safety and health organization.

d. Coordinate with appropriate NASA and contractor safety and environmental health personnel to request a work-place noise-hazard assessment of operations or procedures when changes occur which may increase or decrease personnel exposure to noise.

1.10 Operations Organizations

1.10.1 Operations organizations are responsible for:

a. Coordinating with procurement and engineering organizations in implementing the requirements of NPR 1800.1 as it applies to Buy Quiet and Quiet by Design elimination of hazardous-noise sources.

b. Ensuring facility noise-hazard warning signage is posted and maintained, in coordination with facility managers.

c. Ensuring noise-hazard warnings are posted at the perimeter of temporary noise-controlled areas.

CHAPTER 2: Hearing Loss Prevention Program

2.1 General

2.1.1 The Hearing Loss Prevention Program includes elements with the goal of preventing hearing loss as follows:

a. Observance of noise-exposure limits

b. Exposure assessments

c. Engineering controls

d. Administrative controls

e. Hearing protection devices

f. Medical surveillance

g. Hazard communication

h. Training

i. Records management

2.1.2 It is recognized that undesirable effects of noise are not limited to noise-induced hearing loss (e.g. annoyance, high blood pressure). The KSC Noise and Hearing Loss Prevention Program therefore includes elements of overall noise reduction in the work-place.

2.2 Noise-Exposure Limits

2.2.1 The noise-exposure limit for an employee is an eight hour (8 hour) time-weighted average (TWA) of 85 decibels A-weighted (dBA) or an equivalent dose based on Table A, Appendix C. Exposures at or above 100% of the noise dose are considered hazardous.

2.2.2 The noise-exposure action level for an employee is an 82 dBA 8-hr TWA or equivalent 50% dose.

2.2.3 Exposure to impact or impulse noise shall not exceed the limits listed in Table B, Appendix C.

2.2.4 Impact or impulse noise exposures in excess of 140 decibels (dB) peak sound pressure level are not permitted.

2.3 Engineering Control of Noise in Facility Design

2.3.1 Facility designs shall reduce employee noise exposures through procurement and design of equipment with the intention of achieving realistic and achievable noise criteria. The feasibility and cost of engineering controls may be considered when making decisions about these controls.

2.3.2 Design shall evaluate noise emission when designing and specifying equipment expected to generate noise-emission levels exceeding 80 dBA with the intention of achieving personnel noise-exposure levels below the action level (82 dBA 8-hour TWA or equivalent dose). Guidelines and resources for identification, analysis and selection of low-noise equipment are found at the NASA Web site, Buy Quiet and Quiet by Design.

2.3.4 Design shall utilize feasible engineering controls to reduce or eliminate hazardous noise. Applicable facility plans will be reviewed to assess the adequacy of precautions planned or undertaken to control noise exposures.

2.3.5 Engineering drawings, specifications, and operations concepts, including noise-control measures, shall be coordinated with the affected management organizations and the KSC IHO in the design or planning process.

2.3.6 Where existing equipment or tools have been identified as noise-producing equipment (≥ 80 dBA), feasible engineering controls shall be designed and implemented in a timely manner to reduce noise levels produced by the equipment or tools to less than 80 dBA at the operator's position.

2.3.7 If controls fail to reduce sound levels within the limits of Tables A and B, Appendix C, a warning sign/decal shall be posted and hearing-protection devices or administrative methods of noise-exposure protection will be used.

2.4 Administrative Control of Noise

2.4.1 Operation organizations shall endeavor to reduce employee noise exposure through procurement of new, modified, or replacement equipment with noise-emission levels below the 80 dBA level of concern. Operation managers will specify low-noise emitting equipment, where available, or include available noise-reducing accessories (e.g., mufflers, enclosures) as a part of equipment procurements.

2.4.2 Guidelines and resources for identification, analysis, and selection of low-noise equipment are found at the NASA Web site, Buy Quiet and Quiet by Design. The KSC medical and environmental support contractor Environmental Health can provide assistance in selecting low-noise equipment.

2.4.3 Purchase requests for civil service procurement of noise-producing equipment (≥80 dBA) shall include a copy of a completed NASA Form 1707 and supporting information.

2.4.4 Purchase request for Contractor procurement of noise-producing equipment (≥80 dBA) shall include a copy of the completed KSC Form 28-1103 or equivalent with supporting information.

2.4.5 Operation organizations shall perform necessary preventive maintenance of equipment and noise-reducing accessories as required to maintain low-noise emissions.

2.4.6 Personnel exposures to ototoxic chemicals shall be restricted when identified as a exposure hazard in a noise hazard assessment.

2.4.7 When feasible controls do not reduce employee noise exposure below the limits identified in Tables A and B, Appendix C, a combination of the following measures shall be implemented:

a. Access of personnel to noise hazard areas shall be restricted to the minimum number and/or period of time required to perform a specific task or function.

b. Where hearing protection devices are not sufficient to attenuate noise to less than the applicable noise-exposure limit, the duration of time spent in the noise-hazard area shall be limited, not to equal or exceed the exposure limits in Tables A and B, Appendix C.

c. Warning signs that clearly indicate the hazard of high-noise levels and state the requirement to wear hearing protection shall be posted at the perimeter/entry of noise-controlled work areas.

d. Decals, placards, or other signage that clearly indicates the presence of hazardous noise and states the requirement to wear hearing protection shall be affixed to portable sources of hazardous noise (≥ 85 dBA).

2.5 Hearing Protection Devices

2.5.1 Hearing protection shall be provided to employees who enter designated noise-hazard areas or who perform tasks where exposure to noise is greater than or equal to 82 dBA.

2.5.2 Earmuffs and/or earplugs shall be provided in accordance with 29 CFR 1910.95 and this KNPR. Such equipment will be issued for the exclusive use of each employee and will not be traded or shared.

2.5.3 Personnel shall wear hearing protection whenever engineering and administrative controls do not reduce employee noise exposure to an 85 dBA 8-hr TWA or less. In addition, all persons working within a posted noise-controlled area without regard to their exposure duration will wear hearing protection when noise is present.

2.5.4 Hearing protectors shall attenuate the employee's noise exposure to a level below the noise-exposure limit of 85 dBA 8-hr TWA. For those with an STS, hearing protectors will attenuate exposure to less than an 8-hr TWA of 82 dBA.

2.5.5 A combination of both earmuffs and plugs is required where continuous-noise levels equal or exceed 100-dBA 8-hr TWA, and any exposure equal to or greater than 105 dBA.

2.5.6 Estimation of the adequacy of earmuffs and earplugs shall be in accordance with NPR 1800.1 Section 4.8.3.10, which requires derating using the most conservative method.

2.5.7 The adequacy of hearing-protector attenuation shall be reevaluated whenever the employee's noise exposure increases to a level where the hearing protector provided may no longer provide adequate attenuation. More effective hearing protectors will be provided when necessary.

2.5.8 Where reusable earplugs are used, they shall be permanently issued to the employee, and the employee will be instructed in the proper method of insertion and cleaning of the earplugs. Employees will inspect reusable earplugs for cleanliness and to ensure that they are not damaged prior to each use. Damaged earplugs will not be used.

2.5.9 The user shall inspect earmuffs on a regular basis. Earmuffs that have been damaged, altered, or modified in any way will not be used in hazardous-noise environments. Where replacement parts from the original manufacturer, such as ear cup seals, are available, the earmuffs may be repaired and reused.

2.5.10 Special hearing-protection equipment, such as sound-suppression communications and active noise-reduction headsets may be used in hazardous-noise environments and must be regularly inspected by the issuing agency. Headsets that have been damaged, altered, or modified will not be used in hazardous-noise environments. Where headsets cannot be permanently issued to individuals, the issuer will ensure the headsets are cleaned and sanitized before reissuing. The noise-reduction rating (NRR) assigned to “special hearing-protection equipment” (e.g., noise cancelling earmuffs) shall not exceed the NRR when the noise-suppression/cancelling feature is turned off.

2.6 Exposure Monitoring

2.6.1 An initial investigation of potentially hazardous sound levels shall be conducted when any information, observation, or calculation shows an employee may be exposed to a noise level of 82 dBA 8-hr TWA or greater. This identification includes, but is not limited to:

a. Representative measurements of noise exposure

b. Employee complaints of excessive noise, or any area where it is difficult to understand a normal conversation when the speaker and listener face each other at a distance of approximately three feet, or arm’s distance

c. New equipment, operations, jobs, or procedures with the potential for creating hazardous noise

2.6.2 When an initial determination indicates that any employee's noise exposure may equal or exceed the action level, area noise monitoring shall be conducted to establish the characteristics of the following:

a. Noise source

b. Operations in the noisy area

c. Extent of the area that exceeds 85 dBA

d. Number of affected employees and their exposure duration/frequency

2.6.3 When present, the initial determination will identify employee exposure to ototoxic chemicals and environmental conditions that may contribute to the noise hazard.

2.6.4 When an initial determination shows an employee or group of employees may be exposed to noise at or above the action level, noise dosimetry monitoring shall be conducted to determine the noise dose of the exposed employee, the representative exposure of similarly exposed employees, and appropriate noise controls. Where required, an octave band analysis will be conducted to determine the characteristics of the noise source and aid in the selection of engineering controls.

2.6.5 Monitoring, which is representative of the noise exposure of employees in the work area, shall be performed and repeated whenever any change to facilities, equipment, work practices, procedures, or noise-control measures could increase personnel noise exposure.

2.6.6 Employees and/or their representatives shall be provided an opportunity to observe noise dosimetry and area monitoring activities.

2.6.7 Affected employees shall be notified in writing of the results of noise dosimetry monitoring within 30 days of the employer's receipt of monitoring results.

2.6.8 At a minimum, sound-level meters shall meet the Type II requirements of the most current version of ANSI S1.4 and will be capable of measuring sound in the range of 80-130 dBA. Measurement will be in accordance with the most current version of ANSI S1.13.

2.6.9 Noise dosimeters shall meet the Class 2A-90/80-5 requirements of the most current version of ANSI S1.25 and will be capable of integrating sound levels of 80 dB and above. Measurements will be made in accordance with the most current version of ANSI S12.19.

2.6.10 Noise-exposure monitoring may be conducted using either a noise dosimeter or a sound-level meter. Where a sound-level meter is used to estimate an employee's noise dose, the survey shall include a time and motion study to document the variations in the employee's noise exposure during the work shift.

2.6.11 Reports shall be consistent with the report requirements identified in KNPR 1840.19, Section 2.4.9, Report Requirements for HHE.

2.7 Hearing Conservation Program Enrollment

2.7.1 Whenever an employee's occupational noise exposure is equal to or greater than the exposure limit, or the employee is occupationally exposed above the action level for 30 or more days each year, the employee shall be enrolled in a HCP. For the purposes of HCP enrollment, the employee's noise exposure will be determined without regard to any sound attenuation provided by the use of hearing protectors.

2.7.2 Prior to placement in a job requiring participation in the HCP, and each year thereafter, each employee shall undergo an examination by a physician or other qualified health professional with review by a physician.

2.7.3 The examination shall include an audiogram, a medical examination to determine any medical pathology of the ear, a work history to document past noise exposure, and a medical history to include use of ototoxic medications. If an employee is determined to be suffering from a medical condition that may compromise the validity of the test, the audiogram will be delayed until the condition has abated.

2.7.4 When a physical examination cannot be obtained prior to placement in a job requiring participation in the HCP, or when it is discovered those already assigned to noise-hazard areas have not had a physical exam, one shall be conducted within 30 days.

2.7.5 Employees exhibiting a preexisting medical pathology shall require a review prior to being assigned in conditions that may aggravate their medical condition or ability to work safely in hazardous areas. This includes persons who are considered legally deaf, hearing disabled, or who exhibit medical pathologies that prohibit the use of hearing protectors.

2.7.6 An exit audiogram shall be provided to employees enrolled in the HCP upon termination of employment, transfer to another installation, or retirement. An annual audiogram dated within six months of their last day of occupational exposure may be substituted for an exit audiogram.

2.7.7 In the event of an employee transfer to duties without hazardous-noise exposure, the employee shall remain in the audiometric testing program for at least 12 months following the transfer.

2.7.8 When employees at a Center retain their "work-role position" but change employers due to contract award to a new employer, all medical records applicable to hearing conservation shall be provided to their new employer, including their current baseline threshold.

2.8 Audiometric Testing

2.8.1 An audiologist, otolaryngologist or other qualified physician, or occupational health nurse or technician may perform audiometric testing. Technicians and nurses who perform audiometric tests shall be under the supervision of an audiologist, otolaryngologist, or other physician. Personnel overseeing audiometric testing will maintain current certification through the CAOHC.

2.8.2 Audiometric tests shall consist of pure tone, air conduction, hearing threshold exams with test frequencies at 500, 1000, 2000, 3000, 4000, 6000, and 8000 hertz (Hz) in each ear. Hearing threshold levels will be determined by audiometers calibrated to the zero reference levels of the most current version of ANSI S3.6 standard for audiometers. Audiometric test equipment will meet the specifications, maintenance, and use requirements of the most current version of ANSI S3.6. Where a pulsed-tone, self-recording audiometer is used, it will also meet the requirements of 29 CFR 1910.95 (See Tables A and B, Appendix C).

2.8.3 The audiologist or audiometric technician shall perform a listening check daily, prior to use, to ensure the device is free from distorted or unwanted sounds.

2.8.4 A functional test shall be performed, each day, using an "acoustical ear" calibrator (dBA) Sound Level Meter (SLM) with 9A Type Earphone Coupler. A record will be kept of the daily tests. Deviations of 5 dB or more require an acoustical calibration test.

2.8.5 An acoustical calibration test (using an SLM, octave band filter set, and a National Bureau of Standards 9A Coupler) shall be performed at least annually (semiannually for self-recording audiometers). The calibration test will conform to the requirements of 29 CFR 1910.95. Deviations of 10 dB or more will initiate re-calibration of the intrument.

2.8.6 A complete calibration shall be performed at least every two years or whenever an acoustic calibration test indicates an error of 10 dB or more. The tests will meet the criteria of the most current version of ANSI S3.6. Following the calibration, the front panel of the audiometer will be labeled with a tag indicating calibration to the most current version of ANSI S3.6 and the date of the calibration.

2.8.7 Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table C, Appendix C. Sound pressure levels in rooms used for audiometric testing will be tested using a Type 1 SLM, no less than one time a year.

2.8.8 Employees will be notified in writing of the need to avoid high levels (≥ 82 dBA) of occupational and nonoccupational noise during the 14 hours preceding the audiometric test. Personal hearing protection devices that reduce the employees' exposure to 82 dBA TWA or below are allowable. This time interval will be sufficient to allow recovery from noise-induced temporary threshold shift.

2.8.9 In addition to audiometric test data, each audiogram will, as a minimum, identify the audiometric reference level to which the audiometer was calibrated at the time of testing; the date of the audiogram; the examiner's name; the date of the last calibration of the audiometer; and the name, employee number, and job classification of the individual tested.

2.8.10 A CAOHC Certified Professional Supervisor will compare the employee's baseline audiogram to the annual audiogram to determine if the audiogram is valid and if an STS has occurred. When determining if an STS has occurred, allowance may be used for the contribution of aging to the hearing threshold level by adjusting the audiogram. The procedure described in 29 CFR 1910.95 shall be used.

2.8.11 Audiograms for each ear shall be separately tracked.

2.8.12 When the evaluation of an audiogram indicates a STS has occurred, a retest must occur within 30 days to determine if the shift is persistent. A permanent STS has occurred when the retest confirms the original audiogram results, and the better of the two audiograms will become the confirmed STS. If a retest is not performed, the STS shall become a confirmed STS by default.

2.8.13 The annual audiogram may be substituted for the baseline audiogram when, in the opinion of the CAOHC Certified Professional Supervisor, the hearing threshold shown in the annual audiogram indicates a permanent threshold shift or significant improvement over the baseline audiogram. This audiogram shall be used for comparisons with future annual audiograms.

a. A significant improvement is shown if the average of thresholds at 2, 3, and 4 Kilohertz (KHz) for either ear shows an improvement of 5 dB or more from the baseline and the improvement is persistent in the next audiogram. Age corrections may not be used in determining improvement.

b. When the professional evaluating the audiogram determines that a baseline revision is appropriate, whether due to a persistent STS or improved thresholds, the baseline shall be revised for each ear separately. A baseline audiogram that shows a persistent shift for only one ear may be revised for only that ear. The baseline may not be revised for the other unaffected ear. This procedure is required because it provides a clear indication of how each ear is affected by noise.

c. If a permanent STS is determined, the KSC Form 6-2 will be used to notify the employee's supervisor, safety and health office, Workers' Compensation office, and the KSC medical and environmental support contractor Environmental Health of a permanent STS. A separate letter is provided to the employer for use to ensure employee notification of audiometric results. When further evaluation is recommended to provide further testing or to diagnose other pathology, the recommendation for referral will be indicated on the KSC Form 6-2.

2.9 KSC Medical and Environmental Support Contractor Medical Referrals

2.9.1 Criteria for referral to an audiologist:

a. Baseline audiogram indicating: Average loss greater than 25 dB for 500, 1000, 2000, and 3000 Hz in either ear; average difference between ears of: greater than 10 dB for 500, 1000, and 2000 Hz, or greater than 30 dB for 3000, 4000, and 6000 Hz.

b. Annual Audiogram indicating: Change for the worse in average hearing level in either ear compared to the baseline audiogram: greater than 10 dB for 500, 1000, and 2000 Hz, or greater than 20 dB for 3000, 4000, and 6000 Hz.

c. Variable or inconsistent responses or unusual hearing loss curves.

2.9.2 Criteria for examination by a qualified physician or other qualified licensed healthcare professional:

a. Presence and persistence of ear pain; drainage; dizziness; severe persistent tinnitus; sudden, fluctuating or rapidly progressive hearing loss; fullness or discomfort in one or both ears; or a history of these within the last 12 months.

b. Failure of a previous otologic evaluation on the above criteria requiring a re-evaluation if ear pain, drainage, dizziness, severe persistent tinnitus develops, or if a significant change in hearing levels is observed.

c. A medical pathology of the ear is caused or aggravated by the use of hearing protectors.

d. Hearing is good in only one ear (severe unilateral loss).

e. Chronic otologic problems (such as chronic otitis media or chronic otitis externa, especially if the condition prevents use of personal hearing protection).

f. Diplacusis, inconsistent audiometric findings or other puzzling ear symptoms.

g. Earwax accumulation sufficient to completely obstruct the view of the eardrum with otoscopy or foreign body in the ear canal.

2.9.3 When the examining physician refers an employee to a physician or other licensed health care professional, all relevant medical data shall be provided upon request.

2.10 Work-Relatedness Determination and Reporting

2.10.1 It is the employer's responsibility to determine work-relatedness and reporting of a STS.

a. OSHA recordable STSs shall be recorded in accordance with 29 CFR 1904.10, Recording Criteria for Cases Involving Occupational Hearing Loss.

b. Work-related hearing loss shall also be reported to the NMIS. Hearing loss that meets the definition of deafness will be reported as a Type B mishap. Other OSHA recordable hearing loss will be reported as a Type D mishap. An STS that does not meet the definition of an OSHA recordable incident will be reported as a Close Call.

2.11 Followup Review

2.11.1 When a standard threshold shift is detected:

a. The employee's work environment shall be investigated to include interviews or worksite visits as appropriate to determine if work practices or changes in equipment or procedures have increased the noise hazard.

b. The employee shall be retrained on the hazardous effects of noise and the need to use hearing protection.

c. The employee shall be refitted with hearing protectors offering greater sound attenuation if needed.

d. When hearing protectors have not been previously used, the employee shall be fitted with hearing protectors and will be provided training in their use.

e. The employee's supervisor and responsible safety and health program office shall be notified of the occurrence of an STS, or other work-related hearing loss, and any necessary abatement actions identified in the followup investigation of the employee's workplace.

f. Worker reassignment shall be considered when recommended by a physician or other qualified licensed healthcare professional to prevent a compensable hearing loss. The employer will have ultimate authority and responsibility for worker reassignment. These employees will continue to participate in the HCP.

2.12 Employee Training

2.12.1 Each employee who participates in the HCP shall receive annual training. NASA provided training will include the following:

a. Overview of 29 CFR 1910.95 and this KNPR

b. Review of the effects of noise, ototoxic chemicals and other factors that may contribute to hearing loss

c. Identification of typical hazardous-noise sources found at KSC

d. Purpose of hearing protectors

e. Advantages, disadvantages, and attenuation characteristics of various types of protectors

f. Noise-control principles

g. Instruction on selection, fitting, use, and care of hearing protectors

h. Explanation of the audiometric testing procedure and the purpose of audiometric testing

i. Employee responsibilities in the HCP

2.12.2 Personnel shall be encouraged, during all training opportunities, to use hearing protectors whenever they are exposed to noise during off-duty activities (e.g., lawn mowers, power tools, firearms).

2.12.3 Supervisors of personnel participating in the HCP shall also receive hearing conservation training.

2.13 Access to Records

2.13.1 Copies of this KNPR and 29 CFR 1910.95, and any appropriate records regulated by this standard shall be provided, upon request, to employees, former employees, representatives of employees, representatives of the United States (U.S.) Department of Labor, or others as authorized by the NASA Health Information Management System system of records. Privacy Act provisions will be adhered to, as applicable.

2.13.2 Employer requests for employee records protected by the Privacy Act shall be submitted by using KSC Form 50-346 or, as authorized, with the specific written consent of the employee.

2.14 Maintenance of Records

2.14.1 Records described in this KNPR including the following:

a. Audiograms and associated medical records

b. Employee noise-exposure measurements

c. Measurements of the background sound pressure levels of audiometric test rooms

d. Employee exposure records

e. Associated industrial hygiene survey records

f. Document reviews

g. Equipment maintenance and repair records

h. Employee training records

2.14.2 All the aforementioned records are NASA occupational health records in accordance with NPR 1800.1, and shall be maintained by the Center in accordance with the requirements of 29 CFR 1910.95, 29 CFR 1910.1020, and NPR 1441.1, regardless of contract changes.

Appendix A: Definitions

Action Level - Continuous noise, greater than or equal to a noise dose, in excess of 50 percent of the noise-exposure limits listed in Appendix C, Table A, measured with a dosimeter or sound-level meter on the A-weighted scale, slow response. The action level is criterion for work-place monitoring. Employee exposures that reach this level on 30 or more days per year require participation in the HCP.

Administrative Controls - Any procedure limiting daily exposure to noise by control of the work schedule, work area, or work practices.

Annual Audiogram - Annual audiometric test, obtained subsequent to the baseline audiogram, which is used to detect shifts in the individual's threshold of hearing.

Audiogram - Chart, graph, or table resulting from an audiometric test. An audiogram shows an individual's hearing threshold levels as a function of frequency.

Audiologist - Professional specializing in the study and rehabilitation of hearing who is certified by the American Speech-Language-Hearing Association, or licensed by a state board of examiners.

Audiometer - Electronic instrument used for measuring hearing threshold levels that conforms to requirements and specifications of ANSI S3.6-2010.

Baseline Audiogram - Audiogram against which future audiograms are compared.

Decibel (dB) - A unit of measurement of sound pressure level.

Decibels A-Weighted (dBA) - Unit of measurement of sound level corrected to the A-weighted scale (reference ANSI S1.4-2014), as measured by a sound level meter.

Deafness - The otological condition in which the hearing threshold level for speech, or the average hearing threshold level for pure tones at 500, 1000, 2000, and 3000 Hz, is at least 93 dB (reference ANSI S3.6-1996). This is generally accepted as representing a hearing loss disability for normal speech.

Diplacusis - Condition in which one sound is heard differently by the two ears resulting in the perception of two sounds instead of one.

Engineering Control - Any mechanical device or physical barrier that reduces the sound level at the source of noise or along the path of propagation of the noise to the individual, not including personal protective equipment such as ear muffs or earplugs.

Exchange Rate - The increase in sound level allowed for a corresponding halving of exposure time (also called doubling rate and trading ratio).

Hazardous Noise - A noise hazard exists wherever any operation, process, or procedure generates noise of sufficient duration and intensity to be capable of producing a permanent loss of hearing to unprotected persons when exposed over a working lifetime.

Hertz (Hz) - A unit or measurement of frequency numerically equal to cycles per second.

Impulsive or Impact Noise - Variations of noise level involving peaks of intensity occurring at intervals of more than one second. If the noise peaks occur at intervals of less than one second, the noise is considered continuous.

Medical Pathology - Disorder or disease. For the purposes of this KNPR, a condition or disease affecting the ear which a physician or other qualified licensed healthcare professional specialist shall treat.

Noise - Generally unwanted sound. May also include desired sound (public address systems, alarms, etc.).

Noise Dose - A cumulative measure of noise exposure which takes into account both the intensity of sounds and the duration of exposure to noise during the work shift.

Noise Dosimeter - An electronic instrument that integrates cumulative noise exposure over time resulting in a measurement of noise dose.

Noise-Controlled Area - Any work area where personnel could be exposed to continuous noise equivalent to 85 dBA or greater and impulse noise exceeding the limits listed in Table B.

Octave Band Analysis - An analysis of the standard frequency ranges (31.5–16k Hz) used to characterize noise. The frequency of each band is such that the upper band limit is twice the lower band limit. Octave band analysis is often used in the design of engineering controls to reduce or eliminate noise.

Otitis Media - Infection and inflammation of the middle ear space and ear drum.

Otitis External - Infection and inflammation of the external ear canal.

Otolaryngologist - Physician specializing in diagnosis and treatment of disorder of the ear, nose, and throat.

Representative Exposure - Measurement of an employee's noise dose or 8-hr TWA noise exposure that is representative of the exposure of other employees in that work area or job classification who perform the same tasks and who are exposed to the same noise hazards.

Standard Threshold Shift (STS) - An average hearing threshold shift of 10 dB or more at 2000, 3000, and 4000 Hz in either ear relative to the baseline audiogram or to the most recent audiogram which has established an STS.

Sound Pressure Level - Mathematically equivalent to 10 times the common logarithm of the ratio or the square of the measured A-weighted sound pressure to the Standard reference pressure of 20 micropascals (measured in decibels).

Sound-Level Meter - Electronic instrument for the measurement of sound pressure level.

Time-Weighted-Average (TWA) - Sound level which, if constant over an 8-hr workday exposure, would result in the same noise dose as is measured.

Tinnitus - A noise in the ears, as ringing, buzzing, roaring, clicking, etc.

Appendix B: Acronyms

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CAOHC	Council for Accreditation in Hearing Conservation
dB	Decibels
dBA	Decibels A-weighted
HCP	Hearing Conservation Program
HHE	Health Hazard Evaluation
Hz	Hertz
IHO	Industrial Hygiene Officer
KNPR	Kennedy NASA Procedural Requirements
KHz	Kilohertz
KSC	Kennedy Space Center
NASA	National Aeronautics and Space Administration
NMIS	NASA Mishap Information System
NPR	NASA Procedural Requirements
NRR	Noise-Reduction Rating
OHF	Occupational Health Facility
OSHA	Occupational Safety and Health Administration
SLM	Sound Level Meter
STS	Standard Threshold Shift
TWA	Time-Weighted Average
U.S.	United States

Appendix C: Tables

Table A: Noise Exposure Limits[1] for Continuous Noise

DURATION		EXPOSURE LEVEL[2] dBA
(hours)	(minutes)	
16	960	82
8	480	85
4	240	88
2	120	91
1	60	94
0.5	30	97
0.25	15	100
0.125 or less	7.5 or less	103

[1] Using:
Exchange Rate = 3 dB
Lower Threshold = 80 dB, $T=480/2^{(L-85)/3}$ (T=time in minutes and L=exposure level)
Meter set to slow response

[2] The exposure noted for each sound level for the duration noted is equivalent to 100% of the allowed noise dose. The Action Level is any exposure equivalent to 50% of the exposure duration in this Table.

Table B: Noise Exposure Limits for Impact or Impulsive Noise

SOUND LEVEL (dB)*	PERMITTED NUMBER OF IMPULSES OR IMPACTS PER DAY (imp/day)
>140	none
130	100
120	1,000
110	10,000
*Decibels peak sound pressure level measured with a Type I/II sound level meter with peak hold feature using Z, C-weighting, or linear scale.	

Table C: Maximum Background Sound Pressure Levels for Audiometric Test Rooms

OCTAVE BAND CENTER FREQUENCY (Hertz)	SOUND PRESSURE LEVEL (dB)
500	27
1000	26
2000	34
4000	37
8000	37
Maximum background sound pressure levels are based on ANSI S3.1 which is incorporated by reference in AFI 48-127 and exceeds the requirements promulgated in 29 CFR 1910.95.	